CLAIMS

What is claimed is:

1. A device for generating hydrogen gas, comprising:

a vessel holding an electrolyte solution;

a membrane in the vessel arranged to form a chamber;

a cathode in the chamber and positioned within the electrolyte solution;

an anode in the vessel but not in the chamber and positioned within the electrolyte solution;

a hydrogen gas collection area in the chamber;

a hydrogen gas exhaustion arrangement coupled to the gas collection area; and

an electric source connected to the cathode and the anode.

2. The device according to claim 1, wherein the electric source includes a photovoltaic cell in the vessel.

3. The device according to claim 2, further including an external electric source switchably coupled to the cathode and the anode.

4. The device according to claim 2, wherein the electrolyte and the photovoltaic cell are arranged so that the electrolyte acts to concentrate light rays onto the photovoltaic cell.

5. The device according to claim 2, wherein the vessel has a transparent cover, the transparent cover is constructed to concentrate light rays onto the photovoltaic cell.

6. The device according to claim 5, wherein the cover includes a lens structure.

7. The device according to claim 1, wherein the electrolyte solution is a mixture of water and an acid or salt.

8. The device according to claim 1, wherein the electrolyte solution is a mixture of water and a polymeric gel-type electrolyte.

9. The device according to claim 1, wherein the electrolyte solution is a mixture of water and a solid electrolyte.

10. The device according to claim 1, wherein the membrane is arranged to form an oxygen chamber and the anode is in the oxygen chamber.

11. The device according to claim 1, further including:

a second membrane arranged to form a second oxygen chamber; and

a second anode in the second oxygen chamber and positioned within the electrolyte solution.

12. The device according to claim 1, further comprising:

an oxygen collection area in the vessel; and

an oxygen gas exhaustion arrangement coupled to the oxygen gas collection area.

13. The device according to claim 1, wherein the membrane passes protons but not electrons.

14. The device according to claim 1, wherein the membrane does not pass hydrogen gas.

15. The device according to claim 1, wherein the electric source is a photovoltaic cell external to the vessel.

16. The device according to claim 1, wherein the electric source is a hydroelectric turbine.

17. The device according to claim 16, wherein the hydroelectric turbine has disks and impellers mounted alternately on a shaft, with the disks and impellers positioned in moving water and cause the shaft to turn responsive to water flow.

18. The device according to claim 1, wherein the electric source is a wind turbine.

19. The device according to claim 18, wherein the wind turbine uses a funnel concentrator to direct wind to a set of vanes, each vane having a convex shape above the leading edge and concave shape below the leading edge.

20. The device according to claim 1, further including a cooling-heat transfer chip in thermal communication with the electrolyte and coupled to the electric source.

21. A method for generating hydrogen gas, comprising:

generating an electric current;

applying the electric current to a cathode and an anode, the cathode and the anode being immersed in an electrolyte solution;

conducting protons through a membrane;

generating a hydrogen gas at the cathode and an oxygen gas at the anode;

using the membrane as a barrier between the hydrogen gas and the oxygen gas; and

exhausting the hydrogen gas.

22. The method according to claim 21, further including:

positioning a photoelectric cell in a vessel holding the electrolyte; and generating the electric current with the photoelectric cell.

23. A device for generating hydrogen gas, comprising:

a vessel having a transparent cover;

a membrane arranged in the vessel to form a hydrogen chamber and an oxygen chamber;

a cathode positioned in the hydrogen chamber;

an anode positioned in the oxygen chamber;

electrolyte solution in the hydrogen chamber, the electrolyte solution at a level sufficient to cover the cathode, but allowing a hydrogen collection space;

electrolyte solution in the oxygen chamber, the electrolyte solution at a level sufficient to cover the anode, but allowing an oxygen collection space;

a solar cell in the vessel and positioned so that light can pass through the transparent cover, the electrolyte solution, and onto the solar cell;

power conduits connecting the solar cell to the anode and to the cathode so that electricity generated by the solar cell drives an electrolysis process;

a hydrogen exhaust coupled to the hydrogen chamber; and

wherein the membrane is a proton-passing membrane, and the membrane restricts hydrogen from passing from the hydrogen chamber into the oxygen chamber, and restricts oxygen from passing from the oxygen chamber into the hydrogen chamber.

24. The device according to claim 23, further including a wind-driven electric turbine connected to the cathode and the anode.

25. The device according to claim 23, further including a water-driven electric turbine connected to the cathode and the anode.

26. The device according to claim 23, wherein at least one of the anode or the cathode comprises platinum.

27. The device according to claim 23, wherein at least one of the anode or the cathode comprises a metallic composite material.

28. A method for generating a gas, comprising:

generating an electric current;

applying the electric current to a cathode and an anode, the cathode and the anode being immersed in an electrolyte solution;

conducting protons through a membrane;

generating the gas at the cathode or the anode;

using the membrane as a barrier to contain the gas; and

exhausting the gas.